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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/837,669	04/18/2001	Paul A. Martin	004-4665-1	9894

22120 7590 07/29/2004

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EXAMINER

BULLOCK JR, LEWIS ALEXANDER

ART UNIT	PAPER NUMBER
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2126

DATE MAILED: 07/29/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/837,669	Applicant(s) MARTIN ET AL.	
	Examiner Lewis A. Bullock, Jr.	Art Unit 2126	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 23 April 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-64 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 32-44 and 56-64 is/are allowed.
- 6) ☒ Claim(s) 1-31 and 45-55 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 18 April 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>4/16/04</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 101

1. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Claims 1-8, 14, 16-31 and 45-55 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. The cited claims detail a software sequence for concurrent access to a concurrent shared object. There is no statutory subject matter in the cited claims.

Claim Objections

2. Claim 45 is objected to because of the following informalities: The claim details "at at" on line 5. The examiner suggest that the claim should read "on at" instead. Appropriate correction is required.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over "C++ Standard Library: A Tutorial and Reference" by JOSUTTIS in view of "Managing Long Linked Lists Using Lock Free Techniques" by FAROOK.

As to claim 1, JOSUTTIS teaches a double-ended shared object (list structure) organized as a dynamically sized bi-directional referencing chain of nodes (double linked list), the double-ended shared object employing distinguishing values thereof (via list $\langle \text{Elem} \rangle c(n)$ that creates a list with n elements that are created by the default constructor) (Chapter 6, pg. 24-25). It would be obvious to one skilled in the art at the time of the invention that the constructor initializes elements to a Nil or none value. However, JOSUTTIS does not teach the shared object is concurrent and supports concurrent non-interfering opposing end accesses for states of two or more values.

FAROOK teaches the shared object (linked list) is concurrent and supports concurrent non-interfering opposing end accesses (insert / deletion) for states of two or more values (pg. 9; pg. 14). Therefore, it would be obvious to combine the teachings of JOSUTTIS with FAROOK in order to facilitate greater concurrency to many parallel programs (abstract).

As to claims 2-8, JOSUTTIS teaches the opposing end accesses include pop-type accesses (pop front / pop back), push type accesses (push front / push back), and a spare node maintenance operation (resize) (Chapter 6, pg. 27-28, Table 6-17). FAROOK teaches the accesses are concurrent and non-interfering with one another;

and that node values are opposing end variants, terminal node variants, and dead node variant (via the value of the counter field) (pg. 9; pg. 14).

As to claims 9-13, JOSUTTIS teaches the object is a doubly-linked list of nodes allocated to memory (Chapter 6, pg. 24-25). FAROOK teaches that the object is for parallel programs (abstract). It would be obvious to one skilled in the art at the time of the invention that parallel programs execute on a plurality of processors.

As to claims 14 and 15, FAROOK teaches the nodes that are severed from the referencing chain are explicitly reclaimed (via delete operation) (pg. 12).

Allowable Subject Matter

5. Claims 32-44 and 56-64 are allowed.
6. The following is a statement of reasons for the indication of allowable subject matter: The cited claims detail the concurrent shared object or concurrent double ended queue encoding an interior subset of nodes, sentinel nodes, and one or more spare nodes beyond each of the left and right sentinel nodes wherein execution of any of the access and spare node maintenance operations is linearizable and non-blocking with respect to any other execution of the access and spare node maintenance operations. The prior art of record disclosed the creation / existence of a concurrent shared object or concurrent double ended queue encoded as a linked list, however, the

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queue is not encoded as an interior subset of nodes, sentinel nodes, and one or more spare nodes beyond each of the left and right sentinel nodes. In addition the object does not allow for the execution of any of the access and spare node maintenance operations to be linearizable and non-blocking with respect to any other execution of the access and spare node maintenance operations. For instance, Josuttis teaches the linked list is created with n number of nodes based upon the default constructor and that the access operations are push and pop front, push and pop back, and resize which allows the object to grow if new elements are created by their default constructor. Other publications cited by both the Applicant and the Examiner, disclose performing concurrent operations to both ends of a linked list. However, none of these teachings when combined disclose that the operations, in particular the spare node maintenance operation, is linearizable and non-blocking with respect to another operation. Therefore, the claims are allowable over the prior art of record.

Conclusion

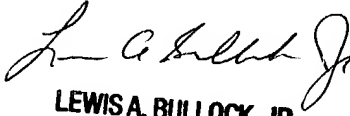
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lewis A. Bullock, Jr. whose telephone number is (703) 305-0439. The examiner can normally be reached on Monday-Friday, 8:30 am - 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Meng An can be reached on (703) 305-9678. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

July 26, 2004


LEWIS A. BULLOCK, JR.
PRIMARY EXAMINER